Left edge topics in Russian and the processing of anaphoric dependencies

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ABSTRACT

This paper investigates the cost of processing syntactic vs. extra-syntactic dependencies. The results support the hypothesis that syntactic dependencies require less processing effort than discourse-derived dependencies do (Koornneef 2008, Reuland 2001, 2011). The point is made through the analysis of a novel paradigm in Russian in which a preposed nominal stranding a numeral can show number connectivity (PAUCAL) with a gap following the numeral or can appear in a non-agreeing (PLURAL) form:

(1) cathedral-PAUCAL/PLURAL, there were three.PAUCAL__

Numerous syntactic diagnostics confirm that when there is number connectivity, the nominal has been fronted via A'-movement, creating a syntactic A'-chain dependency. In the absence of connectivity, the construction involves a hanging topic related via discourse mechanisms to a base-generated null pronoun. The constructions constitute a minimal pair and Reuland's proposals correctly predict that the A'-movement construction will require less processing effort compared to the hanging topic construction. A self-paced reading study for contrasting pairs as in (1) showed a statistically significant slow down after the gap with the hanging topic as opposed to the moved nominal. We take this to support the claim that a syntactic A'-chain is more easily processed than an anaphoric dependency

involving a null pronoun, which must be resolved by discourse-based mechanisms.

1. INTRODUCTION

Natural languages encode anaphoric dependencies in a number of ways. Safir (2004, 2008) introduces the term COCONSTRUAL as a theory-neutral label for any identity relation between two elements, pronounced or not. Coconstruals include antecedent-anaphor relations, filler-gap dependencies, control relations, variable binding, and independent coreference, among others, as illustrated in (1).

(1) (a) **Mike** hurt **himself**.

(b) **What** will college cost ~~**what**~~ in 2020?

(c) **Sandy** tried **PRO** to water ski.

(d) **No waitress** should ignore **her** customers.

(e) **A man** walked in. **He** smiled.

Coconstruals can be encoded in the syntax, in the semantics, or in the discourse. NARROW SYNTAX (NS) is the core of the syntactic computational system. Within Chomsky's Minimalist Program (Chomsky 1995, 2000, 2001), narrow syntax, also called the computational system of human language (Chomsky 1995), is invariant across languages and builds syntactic representations. The mechanisms involved in structure building include Agree, Merge, and Move. Coconstruals formed in the narrow syntax include at least movement relations (Safir 2008) and co-argument reflexives (Reuland 2011).

Reuland (2011: 30-34), following Reinhart (2006), uses the term LOGICAL SYNTAX to refer to the output of narrow syntax augmented with vocabulary required for the structure to be read by the semantic inference system, Chomsky's (1995) Conceptual-Intentional (C-I) interface. It corresponds to logical form in Principles & Parameters frameworks—the syntactic representation enriched by further vocabulary to fully represent logical structure.[2] A prominent element of logical syntax is the representation of bound variable relations, or logical syntax binding (Reuland 2011: 31). In logical syntax, pronouns are translated as variables that become operator-bound. Safir (2008) argues that bound variable anaphora is not represented in narrow syntax representations but is done by interpretive mechanisms at the C-I interface. For simplicity, we will call logical syntax coconstruals semantic dependencies, to distinguish them from (narrow) syntactic and discourse construals, but they will not play a significant role here.

The DISCOURSE component of the grammar situates the logical syntax in the larger context that includes world knowledge, speaker intent, and the full linguistic context. Discourse is where reference relations are established and thus it determines coconstruals that are not part of the grammar, such as coreference relations across sentences.[3]

Reuland (2011: 125), building on Reinhart (1983, 2006), Grodzinsky & Reinhart (1993), and others, proposes the following hierarchy in the economy of the encoding of coconstruals:

(2) Narrow Syntax < logical syntax (C-I interface) < discourse

According to Reuland (2011) and Koornneef (2008), coconstruals formed in components farther to the left on the hierarchy in (2) are favored because they are, in some sense, less costly than those towards the right. For example, narrow syntax coconstruals such as movement relations are favored over discourse-formed coconstruals such as coreference. The economy behind the hierarchy in (2) translates into processing preferences; the processing of construals farther to the left should be easier than those to the right. Koornneef (2008: 46) formulates the following hypotheses stemming from Reuland's system:

(3) (a) The construction of syntactic coconstruals requires less effort than the construction of semantic coconstruals.
(b) The construction of semantic coconstruals requires less effort than the construction of discourse coconstruals.
(c) The construction of syntactic coconstruals requires less effort than the construction of discourse coconstruals.

One challenge in testing these claims is to find coconstruals of the different types that nonetheless represent minimal pairs. The goal is to avoid differences in the constructions that might influence the time course of processing, independent of the coconstrual type of interest, so that any processing differences can be

attributed to the form of the coconstrual and not some irrelevant, interfering factor.

For example, Koornneef investigates the processing of English VP ellipsis examples as in (4) to test (3b). Such examples are ambiguous between sloppy and strict readings, in (5a) and (6a), respectively.

(4) The acrobat likes his jokes and the clown does too.

(5) (a) The acrobat$_i$ likes his$_i$ jokes and the clown$_k$ likes his$_k$ jokes too.

(b) The acrobat (λx (x likes x's jokes)) & the clown (λx (x likes x's jokes))

(6) (a) The acrobat$_i$ likes his$_i$ jokes and the clown$_k$ likes the acrobat$_i$'s jokes too.

(b) The acrobat (λx (x likes a's jokes)) & the clown (λx (x likes a's jokes))

a = the acrobat

The sloppy reading, in which the acrobat likes his own jokes and the clown likes his own jokes, represents a semantic coconstrual of the pronoun *his* with respect to its antecedent, *the acrobat*. There is a bound variable dependency informally represented as in (5b). Such a representation is required to obtain the appropriate interpretation of the missing pronoun in the second clause, which is interpreted with a different referent than in the first clause. The strict reading is the interpretation in which the acrobat likes his own jokes and the clown likes them too. It represents a simple coreference, a discourse coconstrual. In this

representation, the pronoun picks up as its antecedent *the acrobat* and this referent is carried over into the unpronounced VP, as in (6b). Such examples are optimal to investigate from a processing perspective because the meanings and coconstrual types are distinct but the surface forms are identical. Thus, any processing differences can be attributed to the form of the coconstrual. Koorneef (2008) discusses various studies, including his own, showing that speakers prefer the sloppy (bound variable) reading and process it more quickly compared to the strict reading (Shapiro & Hestvik 1995, Frazier & Clifton 2000, Shapiro et al. 2003, Vasić 2006). This supports the claim in (3b) that the construction of semantic coconstruals requires less effort than the construction of discourse coconstruals.

Other studies testing the prediction in (3c) have looked at the processing of reflexives (Burkhardt 2005, Piñango & Burkhardt 2005, Schumacher et al. 2010). As these studies discuss, languages like English and Dutch allow more than one coconstrual type for anaphors. The interpretive mechanism for reflexives varies between a syntactic coconstrual when they are in argument position, (7a), versus a non-syntactic (semantic or discourse) coconstrual when in non-argument positions, (7b, c).[4] The relevant point is that there are multiple ways in which a reflexive can find its antecedent: syntactically in (7a) versus extra-syntactically in (7b, c).

(7) (a) The cellist defended **herself**.

(b) The ballerina put a turban next to **herself**.

(c) Max boasted that the queen invited Lucie and **himself** to tea.

These works confirm the prediction in (3c), showing that examples such as (7b, c) incur increased processing cost compared to the cost of computing the syntactic coconstrual as in (7a). However, one could question these results by arguing that the sentences vary in length; the distance between the antecedent and the reflexive is greater in those cases where the reflexive is used extra-syntactically in (7b, c), which may explain the effect.

Finally, Santi & Grodzinsky (2012) investigated the processing of parasitic gaps vs. A'-bound unstressed pronoun, as in (8a, b):

(8) (a) Which paper$_i$ did the tired student submit $\_\__i$ after reviewing **pg**?

(b) Which paper$_i$ did the tired student submit $\_\__i$ after reviewing it?

They find that parasitic gaps (8a) are processed more efficiently than the A'-bound pronoun in (8b). In principle this could support the conceptions in (3), with the syntactic dependency again processed more efficiently than the anaphoric dependency. However, the difference in their results could also be due to the somewhat degraded nature of (8b) (cf. Ross 1967 and Postal 2001 for a discussion).

Thus, while the overall idea behind (3) is clear, it has not yet received experimental support. The goal of this paper is to test predictions (3c) in a novel experimental way. The hypotheses in (3c) predict, perhaps counter-intuitively, that constructions involving movement will be easier to process than similar constructions with no movement. We introduce two syntactic constructions in Russian that will bear on this issue; they appear minimally different on the surface but involve distinct structures.

The contrast is illustrated in (9). A nominal is fronted, stranding a modifying numeral. The nominal can appear in a form that agrees in number with the numeral, (9a), or it can appear in a non-agreeing plural form, (9b). We will show that the construction in (9a) involves A'-movement of the fronted element, and thus instantiates a syntactic coconstrual between the nominal and the empty category indicated as a struck-through copy. In contrast, (9b) involves coreference between the fronted element and a base-generated empty category, which we propose is a null pronoun; hence (9b) represents a discourse coconstrual.

(9) (a) Sobor-a v gorodke bylo tri ~~sobor-a~~.
cathedral-**PAUCAL** in town was three.PAUCAL

(b) Sobor-ov v gorodke bylo tri *pro.*
cathedral-**GEN.PL** in town was three.PAUCAL

'As for cathedrals, there were three in that town.'

These constructions are ideal for investigating the processing predictions informed by the hierarchy in (2). They are minimally different from each other, maintaining parity in linear and structural distance between the antecedent and the gap, the grammatical role of the antecedent, and the lexical items involved. Only the morphology on the fronted element distinguishes them. Thus, any processing differences at the numeral can reasonably be associated with the coconstrual mechanism involved.

The results of a self-paced reading experiment confirm the processing predictions. The reading time profile for the two constructions is the same until some time shortly after the numeral. At this point, there is a statistically significant increase in reading time in the base-generated construction as opposed to the movement construction. We take this to be an indicator of the effort required to retrieve a discourse referent for the null pronoun and to support Reuland's overall approach.

The remainder of the paper is organized as follows. Section 2 provides background information on Russian numerical expressions and analyzes the contrast above as a difference between movement and base generation. This contrast has not been analyzed before, so the section contributes to our understanding of Russian syntax. Section 3 provides evidence for the syntactic analyses. Section 4 discusses the study investigating the processing of the Russian constructions. This study provides experimental evidence in support of increased

processing cost for discourse coconstruals over syntactic coconstruals, showing that (9a) is processed more quickly than (9b); thus movement relations are less costly than coreference relations. Section 5 presents our conclusions.

2. RUSSIAN TOPIC CONSTRUCTIONS

2.1 *Left dislocation*

LEFT DISLOCATIONS (LDs) are constructions in which a phrase appears at the left edge of a clause, dislocated from its expected position, and is related to some clause-internal anaphoric element. English examples are in (10a, b), with the left dislocated phrase and the anaphoric element, if pronounced, bold-faced.

(10) (a) **Carambolas**, I don't like __.

(b) **Carambolas**, I don't like **them**.

There is much work on LD in the generative literature (see, for example, the collection of papers in Anagnostopoulou et al. 1997, Alexiadou 2006, and references therein) and there is clear consensus that LD constructions are not a unitary phenomenon syntactically or semantically. This is the case both across languages and within a single language. Although our primary concern here is LD in Russian, it will be helpful to survey the LD constructions in some better analyzed languages to understand the space of options. Cross-linguistically, there are two relevant parameters of morphosyntactic variation: i) the form of the

clause-internal anaphoric element and ii) the analysis of the construction as movement or base generation.

Regarding the first, the form of the anaphor varies between a zero, some kind of pronominal element, and an epithet. Example (11a) illustrates English Topicalization, in which the anaphor is a null element. (11b) illustrates Clitic Left Dislocation (CLLD) in Romance, in which the anaphoric element is a preverbal pronominal clitic. CLLD has been very widely discussed and analyzed (Cinque 1977, 1990, 1997[1983], Anagnostopoulou 1994, 1997, Escobar 1997, Rizzi 1997, Cecchetto 2000, Benincà & Poletto 2004, Lopez 2009, Aoun et al. 2010, and numerous other works). (11c) illustrates Germanic Contrastive Left Dislocation (CLD), in which the anaphoric element is a (displaced) demonstrative pronoun (see Ross 1967, van Riemsdijk & Zwarts 1997[1974], Vat 1997[1981], Zaenen 1997, Wiltschko 1997, and others). In (11d), the anaphoric element is a full pronoun. The construction illustrated is called Hanging Topic Left Dislocation (HTLD),[5] see Cinque 1977, Thrainsson 1979, van Riemsdijk & Zwarts 1997[1974], Vat. 1997[1981]. Finally, (11e) illustrates the use of an epithet as the anaphoric element, an option selectively allowed by some languages, such as French, Lebanese Arabic, and Spanish (Alexiadou 2006).

(11) (a) **Carambolas**, I don't like __.

(b) **A Gianni**, Maria **gli** ha parlato recentemente.
to John Maria 3SG.DAT has speak.PTCP recently
'To John, Maria spoke to him recently.' (Italian, Rizzi 1997: 294)

(c) **Die man**, **die** ken ik niet.
that man DEM know I not
'That man, I don't know.' (Dutch, Vat 1997: 70)

(d) **Carambolas**, I don't like **them**.

(e) **Paul**, Pierre vient de se battre avec **cet idiot.**
Paul Pierre come C REFL fight with this idiot
'Paul, Peter has just fought with that idiot.'
(French, Hirschbühler 1997: 56)

The second parameter of variation concerns the actual analysis of the construction. LD can be split into movement analyses, in which some element has been dislocated from a clause-internal position, and base-generation analyses, in which the left dislocated element is base-generated and no movement is involved. In the latter, the left dislocated element is linked to its clause-internal position via interpretive mechanisms. HTLD is typically analyzed as base generation (see, for example, Hirschbühler 1997[1974] and de Cat 2007 on French) while CLLD/CLD receive movement analyses.

The distinction between HTLD and movement has been widely explored in Romance and Germanic languages (see Grewendorf 2008 for a comparison of Romance and Germanic). The distinction has also been explored in Mayan (Aissen 1992 and subsequent work on individual Mayan languages which builds on this paper). Surprisingly, there has been very little work on LD in Slavic. Sturgeon (2008) discusses the situation in Czech, noting a contrast between HTLD and scrambling with respect to syntax, semantics, and prosody. It is hard to find any other detailed discussion of the contrast in Slavic.

This paper begins to fill that gap in Slavic linguistics by exploring the contrast between base-generated and moved LD elements in Russian. Russian shows a difference between HTLD and movement, which replicates the phenomena seen in better-studied languages (Bailyn 2012):

(12) (a) Mark zanimaetsja jogoj každyj den′.
Mark.NOM practices yoga.INSTR every day
'Mark does yoga every day.' (Bailyn 2012: 268)

(b) *movement*
Jogoj Mark zanimaetsja __ každyj den′.
yoga.INSTR Mark.NOM practices every day
'Yoga Mark does every day.' (Bailyn 2012: 268)

(c) *HTLD*
Joga, Mark zanimaetsja eju každyj den′.
yoga.NOM Mark.NOM practices it.INSTR every day
'Yoga, Mark does it every day.' (Bailyn 2012: 268)

Unlike other languages, Russian does not use clitics, so the overt expression of the contrast between base-generated and moved LD is minimal.

The following subsections start with an overview of relevant aspects of Russian grammar and the constructions under investigation. We then turn to the syntax of these constructions and demonstrate that Russian has both types of LD elements, although the difference is sometimes obscured by morphology.

2.2 *Russian numerical expressions*

The form of a Russian noun co-occurring with a numeral differs depending on the numeral. When a noun co-occurs with LOWER NUMERALS—1.5, 2-4, and the

expression ‘both’—it obligatorily takes a special form which is different from the form co-occurring with HIGHER NUMERALS—5 and up. The nominal form co-occurring with lower numerals is usually the same as the genitive singular; however, a few nouns, some of them frequent, have a different form, for example, *čas* ‘hour’, is *časá* with lower numerals and *čása* in the genitive singular (Zaliznjak 1968, Bailyn & Nevins 2008). Such a difference indicates that the nominal form co-occurring with lower numerals is distinct from the genitive singular. The morphological form has received several analyses (see Xiang et al. 2011 for an overview) but, for our purposes, it is sufficient to identify it as PAUC(AL). With numerals 5 and up, Russian requires nouns in the GEN(ITIVE) PL(URAL). The difference is morphologically visible when the modified expression appears in the nominative (and in the accusative for inanimates, which is homophonous with the nominative). It is obscured in all other instances. The distinct morphology is shown in (13) for the numerals ‘three’ versus ‘five’. ‘Three’ requires paucal morphology on the noun while ‘five’ requires genitive plural morphology. [6]

(13) (a) V gorodke bylo tri sobor-a/*ov.
in town was **three**.NOM cathedral-**PAUC**/GEN.PL
'There were three cathedrals in that town.'

(b) V gorodke bylo pjat′ sobor-ov/*a.
in town was **five**.NOM cathedral-**GEN.PL**/PAUC
'There were five cathedrals in that town.'

The numeral and the nominal can be separated; for instance, the nominal can front stranding the numeral. The fronting has the effect of creating a topic, which we will often translate using English 'as for'. When the stranded numeral is a higher numeral, the left dislocated noun must be in the genitive plural form:

(14) (a) Sobor-ov v gorodke bylo pjat′.
cathedral-**GEN.PL** in town was five
'As for cathedrals, there were five in that town.'

(b) *Sobor-a v gorodke bylo pjat′.
cathedral-**PAUC** in town was five
('As for cathedrals, there were five in that town.')

When the stranded numeral is a lower numeral, however, both the expected paucal and genitive plural are possible:[7]

(15) (a) Sobor-a v gorodke bylo tri.
cathedral-**PAUC** in town was three
(b) Sobor-ov v gorodke bylo tri.
cathedral-**GEN.PL** in town was three
'As for cathedrals, there were three in that town.'

The generalization is the following:

(16) A left dislocated nominal that strands a numeral can show number connectivity—the number that would be appropriate were it not left dislocated—or it can appear in the (genitive) plural form.

The behavior of 'one' conforms to this pattern. A noun modified by the numeral 'one' must appear in the singular, (17). When the noun is left dislocated, it can remain in the singular form or appear in the genitive plural form, (18a, b). It may not be in the paucal form, (18c).

(17) Maša kupila odin kalendar′.
Masha bought one.ACC calendar.SG.ACC
'Masha bought one calendar.'

(18) (a) Kalendar′ Maša kupila odin.
calendar.ACC.SG Masha bought one.ACC
'As for calendars, Masha bought one.'

(b) Kalendarej Maša kupila odin.
calendar.GEN.PL Masha bought one.ACC
'As for calendars, Masha bought one.'

(c) *Kalendarja Maša kupila odin.
calendar.PAUC Masha bought one.ACC

Analytically, the presence of number connectivity with paucal in the above data points towards a movement analysis while the absence of connectivity with genitive plural suggests a base-generated HTLD analysis. In what follows we will provide evidence for the following:[8]

(19) (a) For lower numerals, the left dislocated nominal has undergone movement when there is number connectivity (paucal) and it is HTLD when there is no connectivity (genitive plural)

(b) For higher numerals, the left dislocation construction is structurally ambiguous between movement and HTLD

To make these proposals concrete, we assume a structure for numeral-modified nominals in Russian as in (20) (Bošković 2006). The numeral is a QP in the specifier of a functional projection FP that dominates NP. One might identify FP as NumP.

(20) $[_{FP}$ QP $[_{F'}$ F NP]]

Under the movement analysis, the NP complement to the functional head F° moves to a clause-initial position. We take this to be an instance of the widely discussed Russian scrambling (King 1995, Bailyn 1995, 2001, 2003, 2007, 2012, Sekerina 1997, and others) and an instance of A'-movement. We assume that scrambled elements adjoin to any maximal projection. To generate a left-peripheral element, scrambling of NP can target CP or TP. In the case of a base-generated hanging topic, we propose that the topic phrase can adjoin only to CP (Alexiadou 2006) and the complement of F° position is occupied by a null pronominal, *pro*: [$_{FP}$ QP [$_{F'}$ F *pro*]].

In terms of the earlier discussion, the relationship between the scrambled paucal phrase and its trace is subject to syntactic coconstrual. The relationship between the hanging topic phrase and *pro* belongs to discourse coconstrual. The interpretation of *pro* is not determined until the discourse component, where pronouns receive their referents. At this point, *pro* takes as its antecedent a salient entity, the hanging topic. The alternative would be that the hanging topic construction represents a variable binding configuration and thus instantiates a semantic coconstrual, but we believe that this is not the case for two reasons.[9] First, *pro* following a numeral need not have a binder. The antecedent may be in another sentence in the discourse, (21). *Pro* here cannot be a bound variable.

(21) (a) A: U vas est′ žurnaly?
by you is magazine.NOM.PL
B: Da, četyre/odin/devjat′ *pro*.
yes four/one/nine
'A: Do you have magazines? B: Yes, four/one/nine.'

(b) A: Ja obyčno kladu desjat′ ogurcov
1SG usually put ten cucumber.GEN.PL
B: A ja vsego dva/šest′/odin *pro.*
and 1SG only two/six/one
'A: I usually use ten cucumbers (for this recipe).
B: And I only use two/six/one.'

Second, the genitive plural hanging topic need not have a bindee. It can be what van Riemsdijk 1997:4 calls a LOOSE ABOUTNESS LEFT DISLOCATION. Although such examples seem somewhat difficult to construct, they are possible. Some examples in (22) are based on Choo et al. (2007); see also Crockett (1976: 318–335) and Franks (1995: 187).

(22) (a) Podrug v to vremja u menja ostalos′
girlfriend.GEN.PL in that time by me remained
vsego liš′ odna Tanja.
only one.NOM.FEM Tanya
‘Of girlfriends at that time I was just friends with Tanya alone.’

(b) Vremeni prošlo dve nedeli.
time.GEN.SG passed two weeks.PAUC
‘The amount of time that passed was two weeks.’

(c) Klientov bylo devjat′ čelovek.
client.GEN.PL was nine person.GEN.PL
‘The number of customers was nine persons.’

(d) Živnosti u nix dve zolotye rybki.
animals.COLL.GEN by them two gold fish.PAUC
‘Of pets, they have two goldfish.’

To summarize, our analyses can be represented as follows:

(23) *lower numerals*

(a) *left dislocation with number connectivity: movement*
Sobor-a v gorodke bylo tri ~~sobor-a~~.
cathedral-PAUC in town was three

(b) *left dislocation without number connectivity: HTLD*

Sobor-ov$_i$	v	gorodke	bylo	tri	*pro*$_i$.
cathedral-GEN.PL	in	town	was	three	

'As for cathedrals, there were three in that town.'[10]

(24) *higher numerals: structural ambiguity*

(a) *movement*

Sobor-ov	v	gorodke	bylo	pjat′	~~sobor-ov~~.
cathedral-GEN.PL	in	town	was	five	

(b) *HTLD*

Sobor-ov$_i$	v	gorodke	bylo	pjat′	*pro*$_i$.
cathedral-GEN.PL	in	town	was	five	

'As for cathedrals, there were five of them in that town.'

In what follows, we will explore the proposal in (19) as it relates to lower numerals—the contrast in (23)—because number morphology on the dislocated element unambiguously identifies the construction involved.[11]

3. SYNTACTIC EVIDENCE

The evidence in favor of the proposal in (19) comes from a wide range of phenomena. The arguments form two sets. One set is based on diagnostics for movement (section 3.1). These phenomena, which include island effects, reconstruction, and parasitic gaps, confirm that the left dislocated paucal

construction involves A'-movement while the genitive plural one does not. The second set of arguments in section 3.2 appeals to characteristics of HTLD to conversely show that the genitive plural construction is HTLD, while the paucal construction is not. Some of the data used in our discussion in this section are rather nuanced, so we have checked the relevant examples with five naive native speakers; the average ratings on a 1-5 scale (1: completely unacceptable, 5: fully acceptable) are presented in brackets.

3.1 *Movement diagnostics*

3.1.1 *Island sensitivity*

Island (in)sensitivity is a classic diagnostic for movement (Ross 1967) and it is widely used in the LD literature to help decide between movement and HTLD. HTLD is generally insensitive to islands, being a base-generated structure.[12] Russian generally shows sensitivity to wh-islands, complex noun phrase islands, and the coordinate structure constraint, as well as some other types of islands that we will not discuss below (Abels 2003: 160-161; Bailyn 2012: 101-102; Grebenyova 2006, 2007; Kazenin 1997; Sekerina 1997; Stepanov 2007; Testelets 2001: 548–551, 603–604). Therefore the expectation for the constructions under investigation is that paucal LD elements should not be able to relate to gaps inside syntactic islands but the corresponding genitive plural forms should be able to do so. The data confirm this prediction. (25) and (26) illustrate weak factive islands

and wh-islands, respectively. Example (27) illustrates a strong complex noun phrase island.[13]

(25) (a) Udivitel′no, čto oni našli vsego dva slučaja.
surprising that they found only two case.PAUC
'It is surprising that they found only two instances.' [4.2]

(b) *Slučaja udivitel′no, čto oni našli vsego dva.
case.PAUC surprising that they found only two [1.5]

(c) Slučaev udivitel′no, čto oni našli vsego dva.
case.GEN.PL surprising that they found only two
'Of instances, it is surprising that they found only two.' [4.1]

(26) (a) Maša sprosila, gde my našli tri čemodana.
Masha asked where we found three suitcase.PAUC
'Masha asked where we found three suitcases.' [4.7]

(b) *Čemodana Maša sprosila, gde my našli tri.
suitcase.PAUC Masha asked where we found three [1.9]

(c) Čemodanov Maša sprosila, gde my našli tri.
suitcase.GEN.PL Masha asked where we found three
'Masha asked where we found three suitcases.' [3.8]

(27) (a) Ty pomniš′ [vremja, [kogda u nee bylo tri ženixa]]?
2SG remember time when by her was three suitor.PAUC
'Do you remember the time when she had three suitors?' [4.1]

(b) *Ženixa ja pomnju vremja, kogda u nee bylo tri.
suitor.PAUC 1SG remember time when by her was three
[1.2]

(c) Ženixov ja pomnju vremja, kogda u nee bylo tri.
suitor.GEN.PL 1SG remember time when by her was three
'Speaking of suitors, I remember the time when she had three.' [3.9]

3.1.2 *Coordinate Structure Constraint and Across-the-board movement*

Although coordinate structures are often categorized as strong islands, the unique behavior of extraction from coordinate structures allows us to formulate a slightly more nuanced argument for our analyses. Ross (1967) first formulated the Coordinate Structure Constraint (CSC) in (28) which prohibits movement from coordinating conjuncts but he observed that violations of clause (ii) of the CSC could be voided if the same element was extracted from both conjuncts—so called across-the-board (ATB) movement (Williams 1978, Bošković & Franks 2000).

(28) *Coordinate Structure Constraint* (Ross 1967)

In a coordinate structure, (i) no conjunct may be moved, (ii) nor may any element contained in a conjunct be moved out of the conjunct.

With respect to the Russian LD construction, if the number of the fronted element is appropriate for both conjunct positions, the result is grammatical:

(29) (a) Derev′jev Maša kupila tri, a posadila dva.
tree.GEN.PL Masha bought three and planted two
(b) Dereva Maša kupila tri, a posadila dva.
tree.PAUC Masha bought three and planted two
'As for trees, Masha bought three but planted two.'

Under our analysis, (29a) is base-generated as shown in (30a). The hanging topic is coreferential with *pro* in each of the conjuncts. Example (29b) is derived by ATB movement with the derivation in (30b).

(30) (a) Derev′jev [[Maša kupila tri *pro*], a [posadila dva *pro*]].
tree.GEN.PL Masha bought three and planted two
(b) Dereva [[Maša kupila tri ~~dereva~~] a [posadila dva ~~dereva~~]].
tree.PAUC Masha bought three and planted two
'As for trees, Masha bought three but planted two.'

The difference between these two derivations can be seen when the fronted element relates to a gap in only one of the conjuncts. The derivation is licit in the case of base generation, (31a), with the derivation shown in (32a); however, movement, (31b), is illicit because the CSC is violated, as shown in (32b).

(31) (a) Derev'jev Maša kupila tri, a potom posadila vsego
tree.GEN.PL Masha bought three but then planted only
dva jasenja.
two ashes
'As for trees, Masha bought three but then planted only two ashes.'

(b) ?/*Dereva Maša kupila tri, a potom posadila vsego
tree.PAUC Masha bought three but then planted only
dva jasenja.
two ashes
('As for trees, Masha bought three but then planted only two ashes.')

(32) (a) Derev'jev [[Maša kupila tri *pro*], a potom [posadila
tree.GEN.PL Masha bought three but then planted
vsego dva jasenja]].
only two ashes

(b) *Dereva [[Maša kupila tri ~~dereva~~], a potom [posadila
tree.PAUC Masha bought three but then planted
vsego dva jasenja]].
only two ashes

The contrast also appears when the numerals in the two conjuncts differ. Our analyses again correctly lead us to expect a difference in grammaticality.

Genitive plural should still be acceptable because both *pro*s are bound by the hanging topic, (33a). Paucal is unacceptable, (33b), because movement out of one conjunct only violates the Coordinate Structure Constraint, as shown in (34).

(33) (a) Derev′jev Maša posadila tri *pro*, a Petja pjat′ *pro*.
tree.GEN.PL Masha planted three but Petya five
'As for trees, Masha planted three and Petya five.' [4.2]

(b) *Dereva Maša posadila tri, a Petja pjat′.
tree.PAUC Masha planted three but Petya five [1.7]
('As for trees, Masha planted three and Petya, five.')

(34) *Dereva [[Maša posadila tri ~~dereva~~], a [Petja pjat′ *pro*]].
tree.PAUC Masha planted three but Petya five
('As for trees, Masha planted three and Petya, five.')

A relevant restriction on ATB movement is that, despite certain exceptions (Kasai 2004), gaps created by ATB movement should normally occupy syntactically parallel positions (Franks 1993). This prediction holds for the gaps created by movement of the paucal nominal. In (35a), both gaps are in the object position and the result is acceptable, if marginally. In (35b), the first gap is in the object position and the second is in the subject position and the resulting sentence is ungrammatical.

(35) (a) Želanija ja ešče včera tri ~~želanija~~ zagadala,
wish.PAUC 1SG still yesterday three made
a segodnja ešče dva ~~želanija~~ pridumala.
and today still two thought up
'I made three wishes yesterday and thought of two more today.' [3.8]

(b) *Želanija ja tol′ko včera tri ~~želanija~~ zagadala,
wish.PAUC 1SG only yesterday three made
a segodnja dva ~~želanija~~ uže ispolnilos′.
and today two already came true [1.9]
('I made three wishes only yesterday, and today two already came true.')

In contrast, hanging topics can strand numerals even if they are not in syntactically parallel positions:

(36) Želanij ja tol′ko včera tri zagadala,
wish.GEN.PL 1SG only yesterday three made
a segodnja dva uže ispolnilos′.
and today two already came.true
'I made three wishes only yesterday, and today two already came true.'
[3.9]

The behavior of coordinate structures thus yields the expected differences between movement and base generation.

3.1.3 *Number connectivity*

Reconstruction, or connectivity, is another standard hallmark of movement. The term refers to phenomena in which a moved element behaves as though it were in its unmoved (i.e. reconstructed) position for various morphological, syntactic, semantic, and thematic purposes. The appearance of paucal morphology on a LD element, which we used as motivation for proposing a movement analysis, is an instance of number connectivity. The appearance of paucal morphology is determined by the position of nominal before movement. Similarly, the lack of connectivity for number in HTLD argues against movement in that construction; genitive plural morphology is not licensed on the nominal in it post-numeral position, suggesting that the dislocated element did not originate there.

A particularly clear case supporting our contention that the paucal marking on left dislocated elements arises from reconstruction comes from *pluralia tantum*. These are nouns, such as *nožnicy* 'scissors', *sani* 'sled', or *brjuki* 'pants' that have no morphologically singular form and only occur in the plural, (37). In Russian, they are incompatible with paucal morphology as well, as would be required by 'three' in (38a).[14]

(37) Na stole ležali odni/*odna nožnicy/*nožnica.
on table lay one.PL/one.SG scissor.PL/scissor.SG
'A pair of scissors was on the table.'

(38) (a) *Na stole ležalo tri nožnicy.
on table lay three scissors.PAUC
(b) *Na stole ležalo tri nožnic.
on table lay three scissors.GEN.PL
('Three pairs of scissors were on the table.')

Given this morphological restriction, we correctly expect that a left dislocated paucal element will be impossible with such nouns, because the paucal number arises from reconstruction on our analysis. (39a) is ungrammatical precisely because (38a) is. (39b) is acceptable but can only receive an HTLD analysis. The movement analysis is ruled out because (38b) is ungrammatical.

(39) (a) *Nožnicy na stole ležalo tri.
scissors.PAUC on table lay three [0.4]
(b) ?Nožnic na stole ležalo tri.[15]
scissors.GEN.PL on table lay three
'As for scissors, there were three on the table.' [3.6]

3.1.4 *Binding Theory reconstruction*

Binding Theory reconstruction also supports our analyses. Principle C of the Binding Theory (Chomsky 1981) requires that R-expressions such as names be

free. Russian obeys Principle C. Only the non-coreferential interpretation is allowed in (40b); see also Testelets (2001: 609–610) for similar examples.

(40) (a) Maša$_i$ stesnjaetsja, kogda ee$_i$ xvaljat.
Masha is.embarrassed when she.ACC praise.3PL
'Masha$_i$ feels embarrassed when she$_{i,k}$ gets praised.'

(b) Ona$_{k,*i}$ stesnjaetsja, kogda Mašu$_i$ xvaljat.
she is.embarrassed when Masha.ACC praise.3PL
'She$_{k,*i}$ is embarrassed when Masha$_i$ gets praised.'

Now compare the following facts involving LD:

(41) (a) Ona$_{k,*i}$ nasčitala tri [raza, kogda Mašu$_i$ xvalili].
she counted three time.PAUC when Masha.ACC praised.PL
'She$_{k,*i}$ found three times when Masha$_i$ got praised.'

(b) [Raza, kogda Mašu$_i$ xvalili] ona$_{k,*i}$ nasčitala tri.
time.PAUC when Masha.ACC praised she counted three
'As for times when Masha$_i$ got praised, she$_{k,*i}$ counted three.'

(c) [Raz, kogda Mašu$_i$ xvalili] ona$_{k,i}$ nasčitala tri.
time.GEN.PL when Masha.ACC praised she counted three
'As for times when Masha$_i$ got praised, she$_{k,i}$ counted three.'

(41a) confirms a Principle C violation triggered by the pronominal subject c-commanding a name in the number-modified nominal in brackets. In (41b), the paucal nominal is fronted and coreference is still impossible. This can be accounted for because the pronominal subject c-commands the R-expression under reconstruction, again yielding a Condition C violation.[16] In (41c), however, coreference between the name and the pronoun is possible with the genitive plural HTLD element. This is permitted because neither the pronoun nor the name c-commands the other and, in addition, there is no reconstruction to restrict the interpretation, because HTLD does not involve movement.[17]

3.1.5 *Weak Crossover (WCO)*

Weak Crossover prohibits a moving element from crossing over a non-c-commanding pronoun which it is coindexed with:

(42) ??Mike$_i$, I told his$_i$ mother that the police caught ~~Mike~~ smoking pot.

We can explore weak crossover in the Russian LD constructions by including another number preceding a pronoun higher in the clause. This is shown schematically in (43).

(43) NP$_i$ [... [# *pro*$_i$] ... [# *ec*$_i$]]

There are two possibilities for the identification of the empty category in (43), *pro* or trace/copy. If both empty categories are *pro*, then we have HTLD and the result

is expected to be grammatical with a genitive plural topic. There is no movement, and the hanging topic is simply coreferential with both null pronominals:

(44) NP.GEN.PL$_i$ [... [# *pro*$_i$] ... [# *pro*$_i$]]

The data confirm this prediction:

(45) Muzejev oni vse pjat′ *pro* proinformirovali,
museum.GEN.PL they all five informed
čto delegacija posetit vsego dva *pro.*
that delegation will.visit only two
'As for museums, they informed all five that the delegation will visit only two.' [3.75]

If the left dislocated element is paucal, the representation is as follows:

(46) NP.PAUC$_i$ [... [# *pro*$_i$] ... [# ~~NP.PAUC~~$_i$]]

We correctly expect that the result will be ungrammatical because (46) involves a weak crossover violation. The moved NP crosses over the null pronominal that it is coindexed with.

(47) *Muzeja oni vse pjat′ proinformirovali,
museum.PAUC they all five informed
čto delegacija posetit vsego dva.
that delegation will.visit only two [1.1]
(‘As for museums, they informed all five that the delegation will visit only two.’)

3.1.6 *Parasitic gaps*

Parasitic gaps are another standard diagnostic of movement (Engdahl 1983, Culicover 2001). Several researchers suggest that Russian has parasitic gaps (Franks 1992, Culicover 2001, Ivlieva 2007), although their appearance is more limited than in English. For example, Russian parasitic gaps are constrained by the surface identity of case forms such that both extracted elements must be phonologically identical (Franks 1992, 1993, 1995). An example is given in (48b). As observed in Ross (1967), when a parasitic gap is possible, it is preferred to an overt pronoun, (48c).

(48) (a) Kritik$_i$ otpravil etot roman$_k$ v izdatel′stvo,
critic sent this novel in publishing_house
do togo kak *pro*$_i$/on$_i$ pročital ego$_k$.
before read it
‘The critic sent the novel to the publisher before he read it.’ [4.3]

(b) Kakoj roman otpravil kritik ~~kakoj roman~~ v izdatel′stvo,
what novel sent critic in publishing_house
do togo kak pročital **pg**?
before read
'Which novel did the critic send to the publisher before reading?' [4.0]

(c) ???Kakoj roman otpravil kritik ~~kakoj roman~~ v izdatel′stvo,
what novel sent critic in publishing_house
do togo kak pročital ego?
before read it
'Which novel did the critic send to the publisher before reading it?' [2.3]

Our analysis leads to the expectation that only paucal left dislocated elements will license a parasitic gap. The data confirm this prediction:

(49) (a) Kostjuma on otložil srazu tri ~~kostjuma~~, daže ne merjaja **pg**.
suit.PAUC he set.aside at.once three even not trying.on [4.3]

(b) Kostjuma on otložil srazu tri ~~kostjuma~~, daže ne merjaja ix.
suit.PAUC he set.aside at.once three even not trying.on them [3.1]
'As for suits, he picked three right away without even trying them on.'

On the assumption that (49a) involves movement, as shown, the parasitic gap in the gerundial adjunct is licensed and a pronoun in place of the parasitic gap (49b) is only inconsistently accepted by speakers. In (50), with a fronted genitive plural,

in contrast, the gap inside the adjunct clause is a null pronoun, as suggested by the fact that an overt pronoun is equally possible.

(50) (a) Kostjumov on otložil srazu tri *pro*,
suit.GEN.PL he set.aside at.once three
daže ne merjaja *pro.*
even not trying.on [3.9]

(b) Kostjumov on otložil srazu tri *pro*,
suit.GEN.PL he set.aside at.once three
daže ne merjaja ix.
even not trying.on them [4.4]
'As for suits, he picked three right away without even trying them on.'

3.2 *HTLD diagnostics*

In this section, we capitalize on cross-linguistic properties of hanging topics to support our contention that left dislocated genitive plural nominals are hanging topics. These characteristics include resumption/doubling, the loose aboutness relation, and peripheral positioning.

3.2.1 *Doubling*

Because hanging topics relate to a null pronominal, it is expected that they can be replaced by overt expressions, whereas traces generally cannot be.[18] This predicts

that the hanging topic should be resumable by an overt pronoun, a count word, or an epithet but the moved element should not allow such doubling. This prediction is confirmed by the data. Examples (51), (52), and (53) show that the gap can be replaced by a count word, an epithet, or a pronoun, respectively, only in the HTLD construction with the fronted genitive plural.

(51) (a) U Peti bylo tri želania.
by Petya was three wish.PAUC
'Petya had three wishes.'

(b) Želanija u Peti bylo tri (*štuki).
wish.PAUC by Petya was three piece.PAUC

(c) Želanij u Peti bylo tri (štuki).
wish.GEN.PL by Petya was three piece.PAUC
'Wishes, Petya had three'.

(52) (a) U generala bylo četyre soldata.
by general was four soldiers.PAUC

(b) Soldata u generala bylo četyre (*bugaja).
soldier.PAUC by general was four yokel.PAUC

(c) Soldat u generala bylo četyre (bugaja).
soldier.GEN.PL by general was four yokel.PAUC
'The general commanded four soldiers.'

(53) (a) U etogo korolja ostalos′ četyre soldata.
by this king remained four soldier.PAUC
'This king had four soldiers left.'

(b) Soldata u etogo korolja ostalos′ (*ix) četyre.
soldier.PAUC by this king remained them four

(c) Soldat u etogo korolja ostalos′ (ix) četyre.
soldier.GEN.PL by this king remained them four
'Of soldiers, this king had four left.'

3.2.2 *Loose aboutness relation*

As we saw in section 2.2, hanging topics may introduce a loose aboutness relation (Reinhart 1982, van Reimsdijk 1997) in which they do not bind a pronoun, (54a), (55). This is not possible for movement-derived topics, which must bind a trace, (54b).

(54) (a) Podrug/druzej v to vremja u menja ostalos′
girlfriend.GEN.PL/friend.GEN.PL in that time by me remained
vsego liš′ odna Tanja.
only one.NOM.FEM Tanya
‘Of (girl)friends at that time I was just friends with Tanya alone.’

(b) *Podrugi/*druga v to vremja u menja ostalos′
girlfriend.PAUC/friend.PAUC in that time by me remained
vsego liš′ odna Tanja.
only one.NOM.FEM Tanya
(‘Of (girl)friends at that time I was just friends with Tanya alone.’)

(55) Živnosti u nix dve zolotye rybki.
animals.MASS.GEN by them two gold fish.PAUC
‘Of pets, they have two goldfish.’

3.2.3 *Peripheral positioning*

Further differences between the movement and HTLD constructions appear when we consider the linear positions of the LD elements. An investigation of linear order is complicated by the fact that Russian is extremely generous with scrambling. Assuming a constituent is left dislocated, it is always possible that another constituent can scramble over it, placing the LD element in a non-peripheral position. Nevertheless, certain patterns appear when we look at the

position of LD elements with respect to wh-phrases. Such examples are rather hard to construct, and most of them sound marginal, but inasmuch as they are interpretable, the preference is for the LD element to precede the wh-phrase:

(56) (a) Maše nado segodnja posmotret′ celyx
Masha.DAT necessary today see.INF entire
tri fil′ma.
three movie.PAUC
'Masha has to watch an entire three movies today.' [4.2]

(b) Fil′m-a/ov komu segodnja nado posmotret′
movie-PAUC/GEN.PL who.DAT today necessary see.INF
celyx tri?
entire three
'Of movies, who has to watch an entire three today?' [3.7]

(c) Fil′m-a/ov kogda Maše nado posmotret′
movie-PAUC/GEN.PL when Masha.DAT necessary see.INF
celyx tri?
entire three
'Of movies, when does Masha have to watch an entire three?' [3.5]

Such data indicate that both hanging topics and moved elements can occur quite high in the clause. Assuming that wh-phrases are in spec,CP, they are above that

position. We hypothesize they are both adjoined to CP. Where the two constructions differ is in the possibility of the LD element appearing in positions further to the right. Moved elements, but not hanging topics can occur after the wh-phrase. For instance, given the baseline example in (57), the hanging topic is degraded after a wh-phrase, (58a), and ungrammatical after the subject, (58b). These positions are permitted for the paucal nominal, (59).

(57) Maša dala Pete tri apel′sina
Masha gave Petja.DAT three orange.PAUC
i dva banana.
and two banana.PAUC
'Masha gave Petya three oranges and two bananas.' [4.7]

(58) (a) Komu apel′sinov Maša dala tri,
who.DAT orange.GEN.PL Masha gave three
a banana tol′ko dva?
but banana only two [3.5]

(b) *Komu Maša apel′sinov dala tri,
who.DAT Masha orange.GEN.PL gave three
a banana tol′ko dva?
but banana only two [2.1]
'Whom did Masha give three oranges but only two bananas?'

(59) (a) Komu apel′sina Maša dala tri,
who.DAT orange.PAUC Masha gave three
a banana tol′ko dva?
but banana only two [4.2]

(b) Komu Maša apel′sina dala tri,
who.DAT Masha orange.PAUC gave three
a banana tol′ko dva?
but banana only two [3.9]

The freedom of positioning for the paucal element follows if it has undergone scrambling, which can target numerous adjunction positions in the clause, including positions after a fronted wh-phrase and after the subject. The hanging topic, in contrast, is restricted to the clause-peripheral position under our assumptions. The marginal acceptability of (58a) is likely due to the ability of wh-phrases to undergo scrambling themselves.

3.3 *Interim summary*

To conclude, we have examined arguments from a number of quarters that show a systematic difference between left dislocated paucal nominals and genitive plural nominals which strand a low numeral. These differences are summarized in Table 1.

	Paucal	Genitive plural
Shows island sensitivity	Yes	No
Obeys CSC	Yes	No
Requires number connectivity	Yes	No
Reconstructs for Binding Theory	Yes	No
Shows crossover effects	Yes	No
Licenses parasitic gaps	Yes	No
Can be doubled by a pro-form or epithet	No	Yes
Allows a loose aboutness relation	No	Yes
Can occupy intermediate scrambled positions	Yes	No

Table 1

Syntactic properties of paucal vs. genitive plural forms appearing at the left edge of a clause

The directionality and systematicity of these diagnostics confirm that the paucal form stranding a numeral is derived with movement, while the genitive plural form is base-generated. Hence, our initial proposal, repeated below, is validated.

(60) For lower numerals, the left dislocated nominal has undergone movement when there is number connectivity (paucal) and it is HTLD when there is no connectivity (genitive plural)

(61) *lower numerals*

(a) *left dislocation with number connectivity: movement*

Sobor-a v gorodke bylo tri ~~sobor-a~~.

cathedral-PAUC in town was three

(b) *left dislocation without number connectivity: HTLD*

Sobor-ov v gorodke bylo tri *pro*.

cathedral-GEN.PL in town was three

'As for cathedrals, there were three in that town.'

Thus, Russian, like a number of other languages, shows a difference between base-generated and scrambled left dislocated elements, and this difference has a very clear morphological exponent in some contexts. Syntactically, the difference between these two constructions mirrors differences observed in other languages.

The minimal surface difference in (61) also makes this Russian contrast a promising object for a processing study. In particular, these constructions are suitable for testing the processing hypothesis in (3c), repeated below.

(62) The construction of syntactic coconstruals requires less effort than the construction of discourse coconstruals.

4. EXPERIMENTAL EVIDENCE: SELF-PACED READING

The minimal morphosyntactic differences between the scrambling and HTLD constructions analyzed in section 3 provide an ideal testing ground for the relative processing ease of different coconstruals. What we will see from the self-paced reading study is that the movement construction is indeed processed more quickly than the base-generated HTLD construction. We attribute this difference to the coconstrual type. As predicted, discourse coconstruals are processed more slowly than syntactic coconstruals. We reject an alternative explanation according to which the mismatch in number connectivity is the source of the increased processing load.

4.1 *Materials*

We conducted a self-paced reading study of Russian sentences contrasting examples such as the pair repeated below:

(63) (a) *scrambled topic*

Sobor-a v gorodke bylo tri ~~sobor-a~~.

cathedral-PAUC in town was three

(b) *base-generated topic*

Sobor-ov v gorodke bylo tri *pro*.

cathedral-GEN.PL in town was three

'As for cathedrals, there were three in that town.'

Sentences were embedded under an introductory sequence so that the paucal/plural word appeared as the fourth word (W4) in reading. The material preceding this word (W1-W3) consisted of the matrix subject, predicate and complementizer (note that embedded clauses introduced by 'that' in Russian have room for topics, which is very helpful because that allows us to move the first target word away from the beginning of the sentence read in the experiment). The target nominal was separated by the numeral at W9 by four words, and the spillover after the numeral included at least four more words (W10 – W14). Thus:

(64) Maša skazala, čto sobor-a/ov zdes′ snačala sobiralis′
Masha said that cathedral-PAUC/GEN.PL here at_first intended
W1 W2 W3 W4 W5 W6 W7
postroit′ dva, no potom ne xvatilo sredstv.
to_build two but then not sufficed means
W8 W9 W10 W11 W12 W13 W14
'Masha said that at first they were planning to build two cathedrals here but then they ran out money.'

The data were presented in Cyrillic, and the stimuli maintained the Russian punctuation, (see the commas in (64)). In choosing the nouns for comparison, we used only masculine inanimates, to minimize the number of morphological variables, and selected the most common nouns that appeared in both forms,

based on the Russian national corpus http://ruscorpora.ru/index.html. The noun choice was further narrowed down in such a way that each noun occurred a comparable number of times in the phonological forms corresponding to the paucal form and to the genitive plural. We excluded nouns which occurred mostly in one form or the other. We would like to note that, as far as the corpus data are concerned, the use of genitives (singular or plural) with numerals is quite rare. The most common context in which both types of genitives occur is that of adnominal genitive or the genitive of possession (about 70% of all occurrences), followed by the complement of a preposition such as *do* 'toward', *iz* 'out of', etc. (about 20% of corpus occurrences), and the genitive of negation (about 4% of occurrences). This means that the appearance of either form at the beginning of a sentence does not immediately prime the reader to expect a numerical expression; even more importantly, there is no difference between the paucal (genitive singular) and genitive plural form in terms of the expectation of a particular numeral.

The stimuli were normed by 27 naïve native speakers who were asked to rate them on a 1-5 scale. All stimuli with average ratings below 3.5 were excluded. Crucially, there was no difference in rating between the stimuli with a scrambled topic (as in (63a)) and ones with a base-generated topic (as in (63b)). We used 24 pairs of stimuli accompanied by 36 grammatical fillers of comparable length. The stimuli (with norming ratings) are presented in the Appendix 1.

Each sentence was followed up by a comprehension question. The self-paced reading experiment was conducted using the platform LINGER (http://tedlab.mit.edu/~dr/Linger/), with a high sensitivity keyboard. Subjects were tested in a quiet room.

4.2 *Subjects*

We tested 37 subjects. Out of these, eight subjects were below the 85% threshold of correct answers on the comprehension questions and were therefore excluded from the analysis. This left us with 29 subjects, avg. age 26.6, all right-handed, 17 females.

4.3 *Results*

Self-paced reading times were analyzed using linear mixed models with random intercepts for subjects and items and log(raw reading time) as the dependent variable. Tokens more then two standard deviations away from the mean raw reading time of all subjects were excluded from the analysis (89 tokens, 2.1%). Reading time was predicted using the contrast between PAUCAL (scrambled topic) and GENITIVE PLURAL (base-generated topic).

Individual models were fitted for log(residual reading time) of the right edge of the left dislocated nominal (W4), the intervening material (W5 – W8), the numeral (critical word = W9), and the spill-over region (W10 and W11). The reason for including a two-word spillover region is that in self-paced reading, it is

common for effects—especially stronger ones—to be delayed by a word or to spread over onto later regions (Ueno and Garnsey, 2008: 665, Xiang et al. 2011, Polinsky et al. 2012). Such a delay is particularly relevant for highly literate readers who go through words very quickly in self-paced reading paradigm, so that effects are often delayed one or two words (Mitchell 1984, 2004). Additionally, in the case of our stimuli, the possibility of a delay is particularly likely because the critical word (W9) is very short (three to six letters) and the next word (W10) is also extremely short (two to four letters).

Average word-by-word residualized reading times are shown in Figure 1, with the full data in Appendix 2.

< Insert Figure 1 about here >

At the left dislocated nominal (W4), there was no statistically significant difference in reading times between the two case forms (β=-23.44, t=0.979, p=0.32). This lack of effect confirms that our efforts to equalize the frequency of the two case forms were successful. The lack of effect at W4 also suggests that the parser cannot anticipate the remainder of the sentence based on the case form. The differences in the W5-W8 regions were also not significant (**W5**: β=-25.25, t=-1.2, p=0.19; **W6**: β=-28.27, t=-1.50, p=0.13; **W7**: β =-27.2, t==1.37, p=0.17; **W8:** β=-5.567, t=-0.42, p=0.72). At the numeral (W9), there was again no difference between the two conditions (β=-10.83, t=-0.41, p=0.68).[19] We also

computed aggregate statistics over the W4-9 regions (testing the possibility that this is the region of the active search which can be visible from the aggregate reading times), and the difference was again not significant (β=-123.71, t=-1.70, p=0.09). There was equally no effect at the first spillover word W10 (β=-25.53, t=-2.05, p=0.14), which is likely due to the fact that it was very short (two or three letters). At the second spillover word (W11), there was a strong effect of the case difference (β=46.54, t=-2.19, p=0.0248), with the genitive plural (base-generated) condition being read much more slowly than the paucal (movement) condition. The effect did not continue after W11.

4.4 *Discussion*

We attribute the slower processing in the HTLD case to the discourse coconstrual involved, in contrast to the syntactic coconstrual in the scrambling case. Thus our initial hypothesis is confirmed. However, before accepting our conclusion regarding processing differences between the two left dislocation strategies, it is important to consider alternative explanations of the increased reading time for HTLD over movement. We are grateful to the anonymous reviewers for suggesting a number of these possibilities.

4.4.1 *Morphological mismatch*

Our results may have a morphological explanation, namely, that the base-generation condition represents a morphological mismatch, which causes

increased reading times. Once the reader reaches the numeral 2, 3, or 4, s/he realizes that s/he needs the paucal form of the nominal but instead has the genitive plural. This mismatch causes the slowdown reported above.

The effects of morphological mismatches on processing have been noted by a number of studies (see Molinaro et al. 2011 for a summary of the ERP literature on agreement mismatches). Hartsuiker et al. (2003) and Wagers et al. (2009), among others, document slowdowns in behavioral measures for subject-verb agreement mismatches in person, number, and/or gender; Fanselow & Frisch (2006) document effects of disagreement in number within German discontinuous nominals. An explanation according to which a morphological mismatch causes a slowdown would make our own explanation superfluous. At present, however, we do not know enough about the effect of morphological mismatches on processing. Our understanding of how morphological mismatches influence processing is insufficient to clearly connect the two. Further experimentation is needed to determine whether mismatches result in processing difficulty independent of grammaticality.

We will nevertheless suggest that acceptability ratings speak against a mismatch explanation for our data. Recall that our normers rated all the sentences as comparable, and we did not include any sentences rated lower than 3.5 on a 5-point scale. That is, despite the apparent mismatch, the sentences are in fact grammatical. This is different from the agreement mismatch data reported in the

above studies, where the mismatch results in significantly lower acceptability ratings (see particularly Fanselow & Frisch 2006 for German).[20]

4.4.2 *Frequency effects*

It is possible that the movement construction may be processed more quickly if the movement construction is more frequent in the language than the HTLD construction. Corpus data indicate that this is not the case. We took the first 100 cases from the Russian National Corpus (http://www.ruscorpora.ru/index.html) of a fronted genitive corresponding to a post-numeral context. 80% of these contained a fronted genitive plural while only 20% contained a fronted paucal. Thus the base-generated construction is four times more frequent, and yet it causes a larger slowdown in reading. A frequency-based explanation is thus not supported.

4.4.3 *Syntactic indeterminacy*

A third possibility is that the fronted genitive plural element might be more difficult to process because it introduces a higher degree of syntactic indeterminacy compared to the fronted paucal. The logic is as follows. When the reader encounters an initial genitive plural, this DP is compatible with a gap following 'many', 'few', and all the numerals. Thus, few expectations/predictions are made about the following material. When the reader encounters an initial paucal element on the other hand, this DP is compatible with a gap following only

the handful of numbers that select the paucal (1.5, 2, 3, 4, and 'both'). The reader thus has a high expectation of what will follow with a low amount of syntactic indeterminacy.

A number of recent studies have shown that linguistic material that creates an early structural or lexical expectation facilitates the processing of later material. For example, preverbal adverbs indicating that a verb is about to arrive cause faster verb reading (see Boston et al. 2011 for English, German, Vasishth 2003 for Hindi); pronouns in those environments that make cataphora likely facilitate the subsequent processing of a name (see van Gompel & Liversedge 2003 for English); and contexts where a possessor predicts a following noun yield faster or stronger early detection of syntactic anomalies than contexts where the same possessor does not predict a following noun (see Lau et al. 2006).

With respect to the contrast discussed in this paper, the specific hypothesis is that the gap associated with a genitive plural leads to greater uncertainty and does not allow the parser to make an early commitment to an interpretation as compared to the gap corresponding to a paucal fronted element. The greater uncertainty brought about by the gap associated with a genitive plural translates into heavier processing costs.

A consideration of the full distribution of fronted genitive phrases in the language suggests to us that this is not the right way to look at things. Recall that the paucal form is usually homophonous with the genitive singular. Genitives,

both singular and plural, participate in numerous constructions beyond the context where they strand a numeral. Bailyn (2012: 199–205) discusses a number of such uses:

(65) contexts in which the genitive can appear

- (a) adnominal genitive
- (b) genitive of negation
- (c) quantificational genitive (with words like ‘many’, ‘few’, and numerals)
- (d) complement of a preposition
- (e) complement of an intensional predicate
- (f) partitive genitive

Genitives can be fronted with all of these constructions with the majority of cases involving (65a, b), adnominal genitives and the genitive of negation. Table 2 below shows a count from the Russian National Corpus of the statistical distribution of fronted genitives according to these contexts.

	Tokens	Adnominal Genitive	Genitive of Negation	Other
GEN.SG (= PAUCAL)	2117	82% (1645)	15% (410)	3% (62)
GEN.PL	2448	80% (1968)	18% (432)	2% (48)

Table 2

Statistical distribution of fronted genitives by context (Russian National Corpus)

The data indicate that fronted genitive singular and plural occur with about equal frequency overall (2117 tokens versus 2448 tokens). The data also indicate that the lion's share of these fronted genitives do not involve a stranded numeral. 97%-98% involve a fronted adnominal genitive or a fronted genitive of negation. Only 2%-3% involve other uses, which subsume the uses in (65c–f) including the stranded numeral case. Thus, the number of tokens involving fronted genitives stranding a numeral is extremely small in the context of all constructions with a fronted genitive. In the larger context of the Russian grammar then, the low syntactic indeterminacy of a fronted paucal in the stranded numeral construction is completely overshadowed by the other uses, as the appearance of left dislocated genitive form is not giving the reader an expectation of a later numeral—lower or

higher. Given this, the indeterminacy of expectations is about the same for both forms and is an unlikely explanation for the results we report.

4.4.4 *Information structure*

Finally, the results may be a consequence of information structure. The two constructions may have different discourse functions, and the HTLD construction may be more difficult to process in the context-less, out-of-the-blue environments given to our subjects (as compared to the movement construction). Embedding the data in appropriate discourses might eliminate the difference. Two considerations argue against this proposal: First, we were unable to see any information structural difference between the two constructions tested. Both signal a topic. Although Sturgeon (2008) discusses differences between the two constructions in Czech concerning contrastiveness (see footnote 7), we do not know if the same differences exist in Russian and our test sentences did not invite a contrastive interpretation. Second, grammaticality judgments also did not indicate that the HTLD construction was degraded without a discourse context.

5. CONCLUSIONS

In this paper we analyzed a contrast in Russian between two constructions with a clause-initial nominal and a stranded paucal numeral. In one the nominal appears in a non-agreeing (PLURAL) form; in the other, the nominal shows number connectivity (PAUCAL) with a gap following the numeral:

(66) (a) cathedral-PLURAL, there were three.PAUCAL *pro*

(b) cathedral-PAUCAL, there were three.PAUCAL *ec*

We have shown, using numerous syntactic diagnostics, that in the absence of connectivity, the construction involves a hanging topic related via discourse mechanisms to a base-generated null pronoun. Under number connectivity, the nominal has been fronted via A'-movement, creating a syntactic dependency. Thus, the two constructions constitute an excellent syntactic minimal pair.

We used the Russian contrast to test the hypothesis that syntactic dependencies require less processing effort than discourse-derived dependencies do (Koornneef 2008, Reuland 2001, 2011), in particular, that movement is less burdensome for processing than pronominalization (see also Hornstein 2001). We conducted a self-paced reading study using sentences that instantiate the contrast in (66) and found a statistically significant slowdown after the gap in constructions with the hanging topic as opposed to the moved nominal. This supports the claim that a syntactic A'-chain is more easily processed than an anaphoric dependency involving a null pronoun; the latter must be resolved by discourse-based mechanisms which require relatively more resources.

APPENDIX 1: STIMULI WITH THEIR RATINGS BASED ON A 1-5 NORMING SCALE

(1) (a) Экскурсовод рассказал, что музея здесь должны были построитьтри но средств не хватило. 3.78

(b) Экскурсовод рассказал, что музеев здесь должны были построить три но средств не хватило. 3.67

(2) (a) Мы же решили, что шара на детском празднике должно быть три, а ты принес один. 4.07

(b) Мы же решили, что шаров на детском празднике должно быть три, а ты принес один. 3.92

(3) (a) Маша считает, что парка в этом районе может быть два или возможно даже больше. 3.72

(b) Маша считает, что парков в этом районе может быть два или возможно даже больше. 3.66

(4) (a) Дед рассказывал, что острова в этом море могло быть три, но нашли пока только два. 3.75

(b) Дед рассказывал, что островов в этом море могло быть три, но нашли пока только два. 3.84

(5) (a) Дима утверждает, что способа решения задачи должно быть два, но я вижу только один. 3.56

(b) Дима утверждает, что способов решения задачи должно быть два, но я вижу только один. 3.73

(6) (a) Меня удивило, что слога в каждом слове оказалось всего три, мне послышалось четыре. 4.07

(b) Меня удивило, что слогов в каждом слове оказалось всего три, мне послышалось четыре. 3.80

(7) (a) В учебнике написано, что дворца у этого царя было всего два, один летний, другой теплый. 3.66

(b) В учебнике написано, что дворцов у этого царя было всего два, один летний, другой теплый. 3.78

(8) (a) Я-то думал, что парохода по Каме всегда плавало только два, но здесь написано пять. 4.12

(b) Я-то думал, что пароходов по Каме всегда плавало только два, но здесь написано пять. 3.93

(9) (a) Я не подозревала, что гастронома на этой остановке окажется целых четыре, ведь здесь немноголюдно. 4.06

(b) Я не подозревала, что гастрономов на этой остановке окажется целых четыре, ведь здесь немноголюдно. 3.89

(10) (a) Миша боялся, что рюкзака у них дома окажется всего два, вот он и принес свой, проверенный. 4.11

(b) Миша боялся, что рюкзаков у них дома окажется всего два, вот он и принес свой, проверенный. 3.93

(11) (a) Мама говорит, что апельсина у нас дома осталось только три, так что купи еще килограмм. 4.17

(b) Мама говорит, что апельсинов у нас дома осталось только три, так что купи еще килограмм. 4.20

(12) (a) В рецепте сказано, что банана в эти оладьи надо положить два, но я положила один. 3.89

(b) В рецепте сказано, что бананов в эти оладьи надо положить два, но я положила один. 3.93

(13) (a) Учительница написала, что театра в этом году мы посетим два, но пока неизвестно, когда. 3.69

(b) Учительница написала, что театров в этом году мы посетим два, но пока неизвестно, когда. 3.84

(14) (a) Нина обещала, что стакана она вечером принесет еще три, так что посуды хватит. 3.72

(b) Нина обещала, что стаканов она вечером принесет еще три, так что посуды хватит. 3.86

(15) (a) Мне кажется, что батона на вечер надо купить всего два, потому что хлеба много. 3.91

(b) Мне кажется, что батонов на вечер надо купить всего два, потому что хлеба много. 4.03

(16) (a) У Молоховец написано, что ножа с этой стороны полагается класть три, а поперек еще один. 3.63

(b) У Молоховец написано, что ножей с этой стороны полагается класть три, а поперек еще один. 3.81

(17) (a) Доктор сказал, что пирожка больному ребенку можно дать два, в крайнем случае три. 4.07

(b) Доктор сказал, что пирожков больному ребенку можно дать два, в крайнем случае три. 3.85

(18) (a) Рыболов хвастался, что карпа ему вчера удалось поймать три, а щуку пока одну. 3.64

(b) Рыболов хвастался, что карпов ему вчера удалось поймать три, а щуку пока одну. 3.81

(19) (a) Дима сетовал, что рыжика он пока нашел только два, а уже пора идти домой. 3.78

(b) Дима сетовал, что рыжиков он пока нашел только два, а уже пора идти домой. 3.86

(20) (a) Старик расстроился, что подвига рыбка может совершить всего два, ему хотелось больше. 3.69

(b) Старик расстроился, что подвигов рыбка может совершить всего два, ему хотелось больше. 3.73

(21) (a) Мне рассказывали, что перехода здесь собирались прорыть еще три, но не хватило денег. 3.97

(b) Мне рассказывали, что переходов здесь собирались прорыть еще три, но не хватило денег. 4.03

(22) (a) На митинге кричали, что закона новая власть опубликовала уже четыре, а исполнять их некому 3.67

(b) На митинге кричали, что законов новая власть опубликовала уже четыре, а исполнять их некому. 3.74

(23) (a) Мне кажется, что дивана в этот салон надо поставить два, один у стены, другой посередине. 4.10

(b) Мне кажется, что диванов в этот салон надо поставить два, один у стены, другой посередине. 3.96

(24) (a) Ходили слухи, что дома у нее еще до войны было три, а не один, как ты говоришь. 3.71

(b) Ходили слухи, что домов у нее еще до войны было три, а не один, как ты говоришь. 3.98

APPENDIX 2: READING TIME DATA

Word	Movement condition				Base-generated condition			
	reading time	standard deviation	standard error	confidence interval	reading time	standard deviation	standard error	confidence interval
1	556.73	347.0611	20.037583	39.43255	582.2	433.986	25.056193	49.30883
2	559.1267	278.3534	16.070741	31.62609	570.43	310.407	17.921355	35.26797
3	476.0733	180.3689	10.413606	20.49324	463.5267	146.1276	8.436683	16.6028
4	569.79	328.4569	18.963465	37.31877	561.31	289.467	16.712385	32.8888
5	560.1	265.495	15.32836	30.16513	533.5067	250.6359	14.470471	28.47687
6	548.2367	278.7696	16.09477	31.67338	520.2867	225.5897	13.024428	25.63116
7	550.2	309.758	17.883885	35.19423	521.9167	214.7404	12.398044	24.39848
8	499.25	184.7023	10.663794	20.9856	500.52	185.5416	10.712252	21.08096
9	569.1867	380.7571	21.983021	43.26104	558.4767	325.4771	18.791431	36.98021
10	482.57	184.6748	10.662207	20.98247	481.84	167.2468	9.655996	19.00232
11	490.0267	220.8032	12.748081	25.08733	553.6133	375.9963	21.708156	42.72012
12	567.7233	269.8542	15.58004	30.66042	563.6761	299.969	17.799887	35.03698
13	812.5787	653.091	44.437214	87.58838	875.6459	715.9294	49.521873	97.62914

Table 3

Raw reading times by word, averaged in ms

Word	Movement condition				Base-generated condition			
	reading time	standard deviation	standard error	confidence interval	reading time	standard deviation	standard error	confidence interval
1	471.23	341.9777	19.74409	38.85498	491.45	424.8927	24.531191	48.27566
2	430.1267	279.6762	16.14711	31.77638	434.43	307.3465	17.744657	34.92024
3	431.0733	180.3689	10.413606	20.49324	418.5267	146.1276	8.436683	16.6028
4	475.59	327.6621	18.917581	37.22847	452.56	288.0852	16.632608	32.7318
5	472.25	263.0589	15.187714	29.88835	446.3567	250.116	14.440456	28.4178
6	463.9367	276.0981	15.940531	31.36984	434.5867	221.9327	12.813289	25.21565
7	451.1	305.4321	17.63413	34.70273	423.5167	213.5732	12.330656	24.26586
8	422.5	185.2923	10.697857	21.05263	418.52	183.1588	10.574679	20.81023
9	505.0867	378.9092	21.876334	43.05109	495.0767	324.7815	18.75127	36.90118
10	439.62	183.3699	10.586864	20.8342	428.54	167.1374	9.649682	18.9899
11	397.6767	219.8057	12.69049	24.97399	457.6633	375.4655	21.677509	42.65981
12	486.1733	268.5656	15.505645	30.51402	484.3451	301.4635	17.888568	35.21153
13	739.5231	652.565	44.401427	87.51784	798.6364	715.7432	49.508995	97.60375

Table 4

Residualized reading times by word, averaged in ms

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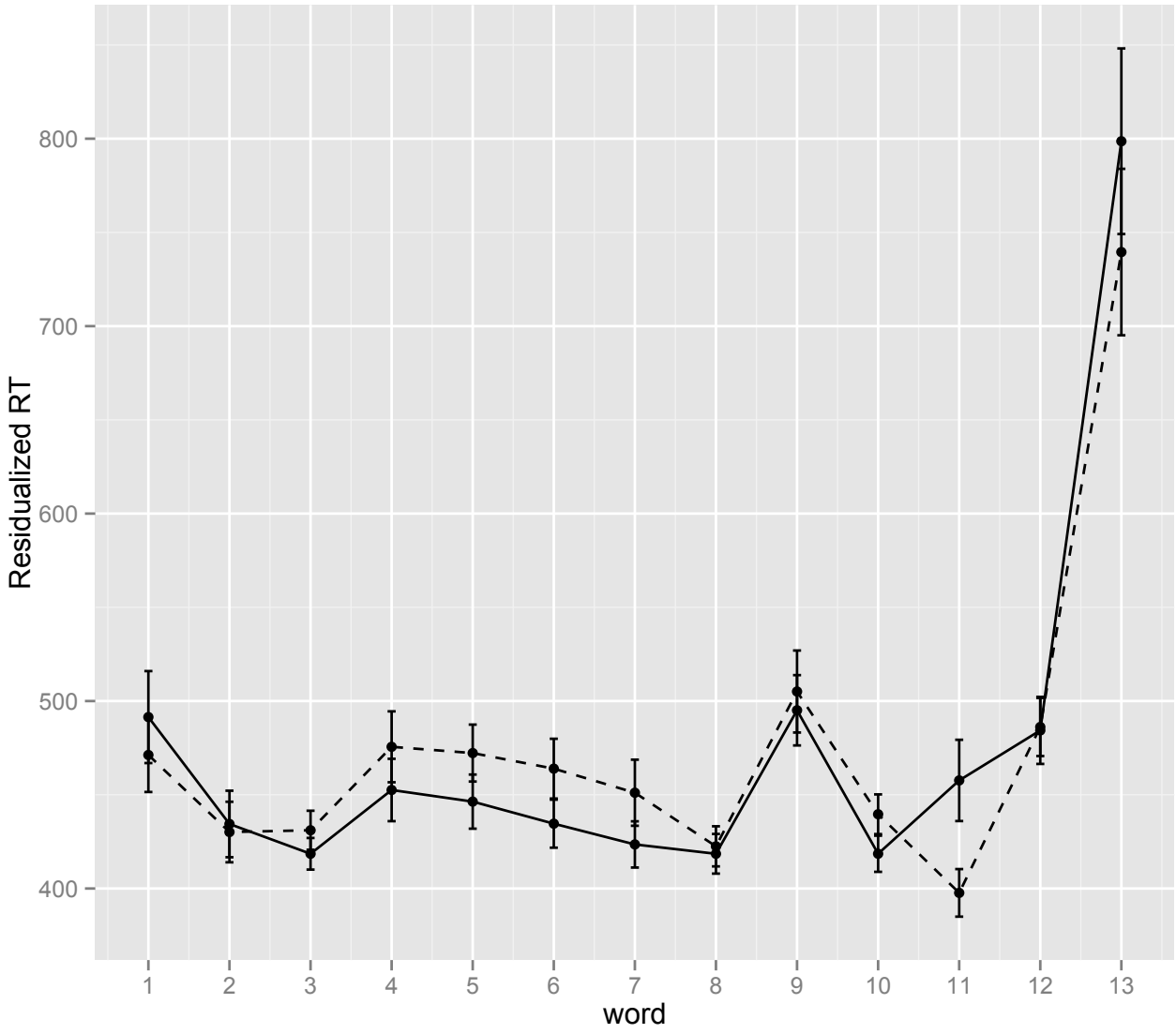
Figure 1

Word-by-word reading times (residualized RTs, ms) for hanging topic constructions with scrambling and base generation (29 subjects)

Dotted line: scrambling (paucal condition); solid line: base generation (genitive plural condition)


800
700
600
500
400
Residualized RT
1
2
3
4
5
6
7
8
9
10
11
12
13
word

ENDNOTES

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The following glossing abbreviations are used: COLL-collective, PART-partitive, PAUC-paucal. Other abbreviations follow the Leipzig Glossing Rules.

[2] Logical form is different from Logical Form (LF) (Chomsky 1976, May 1985), a narrow syntax level of representation that results from application of covert movement.

[3] Evans (1980) specifically argues that co-reference is not part of the grammar (i.e. narrow syntax).

[4] The latter use has been variously called an exempt anaphor (Pollard and Sag 1994), a logophor (Reinhart and Reuland 1993), or a d(iscourse)-linked anaphor (Schumacher et al. 2010).

[5] The term Hanging Topic Left Dislocation was originally proposed by Alexander Grosu (Cinque 1977: 406).

[6] In this example and next, we show the morphological division of the nouns in question. However, since Russian genitive plural and paucal forms vary by declensional class, in the examples below we will typically only indicate the status of a form in the glosses without showing any morpheme boundaries.

[7] To our knowledge, Isaac Kozinsky (1945-1992) was one of the first people to identify this contrast, in the 1980s. He never published anything on it but he brought it up a number of times in his presentations.

The construction with the fronted genitive plural nominal is discussed by Crockett (1976: Chapter 5), Pesetsky (1982: 233-236), who refers to this construction as Crockett-sentences, House (1982), Franks (1995: 186-192), Partee & Borschev (2006), and Choo et al. (2007).

There does not seem to be any information-structural difference between the two options. Both constructions—with the fronted nominal showing number

agreement or genitive plural—function as topic marking constructions, marking either a plain topic or contrastive topic. The latter is underscored by the use of the overt contrastive particle *–to*, (i). We cannot rule out discourse as an explanation for the processing differences we report later; however, we are unable at this point to identify what relevant the relevant factors would be.

(i) Dači/Dač-to u nix tri,
country.house.PAUC/country.house.GEN.PL-CONTRAST by them three
a kvartir ni odnoj.
but apartment.GEN.PL not one.GEN
'While they have three country houses they don't have a single apartment.'

The situation is clearer in Czech. In her insightful comparison of hanging and scrambled topics in Czech, Sturgeon (2008) shows that the two are associated with different intonation contours and interpretations. The scrambled type is characterized by a significantly greater rise than the hanging type. In further comparing hanging and scrambling topics, Sturgeon writes: "I conclude that the [hanging topic] construction is a topic promotion device. Hanging topics have been evoked (either overtly or as members of a previously evoked set) in the preceding discourse, but are, as yet, non-topical. Appearing in the left edge hanging topic position promotes them to sentence topic status. Their status as

sentence topic is confirmed by the fact that they perseverate in the following discourse. [Scrambled] elements, on the other hand, exhibit a contrastive topic discourse function. The discourse referents of [scrambled] elements do not perseverate in the discourse, but, are, instead, contrasted with other members of a set of alternatives with respect to an open proposition." (Sturgeon 2008: 146). In order to test these observations for Russian, one would need to conduct an extensive corpus study, something that is beyond the scope of this paper.

[8] A reviewer asks why the HTLD nominal is genitive plural as opposed to the more usual nominative found on hanging topics (see Bailyn 2012: 268-269). Genitive plural is required when the associated element to the right in the clause is a quantifier (numeral, 'many', 'few'), negation, comparison, or an intensional predicate. These are standard contexts where the structural genitive case appears, assigned by a quantificational head (see Bailyn 2012: 199-200). We hypothesize that the genitive plural is necessary to indicate a partitive interpretation related to the quantified set.

[9] Wiltschko (1997: 331) also claims that HTLD is not a variable binding construction in Dutch.

[10] The acceptability of these two patterns is different: While HTLD as in (23b) is always acceptable, the acceptability of the movement variant in (23a) varies with the lexical items. For instance, masculine nouns seem preferable to feminine

nouns. This variability certainly warrants further investigation but is beyond the scope of this paper. The examples used below are limited to those that were accepted by all or most of our consultants.

[11] We will not be discussing the structurally ambiguous cases such as (22); however, the predictions are clear: if a structure is well-formed under either the hanging topic or movement analysis, then such sentences with higher numerals should be grammatical.

[12] The diagnostic occasionally yields conflicting results. For example, Cinque (1990) claims that Italian CLLD, a movement construction, is sensitive only to strong islands, and not weak ones (see Szabolcsi 2006 for discussion of the difference). However, Lopez (2009) shows that this conclusion is mistaken and CLLD elements can actually be shown to be sensitive to all kinds of islands, as long as the right contextual conditions are met.

[13] A number of examples presented here and further below are judged "colloquial", and some may be unacceptable from a prescriptivist standpoint; this may account for variation in judgments.

[14] The sentence can be expressed by using a measure noun *para* 'pair' or a collective numeral *troe* 'three.COLL' but that is irrelevant to our point.

[15] A preference for a collective numeral may be the reason why (39b) is degraded.

[16] The speakers we consulted all accepted the contrast in (41b, c); however, an anonymous reviewer informs us that s/he does not and rejects both. We have no explanation as to why some idiolects do not get a contrast in (41b, c).

[17] In theory, Principle A could also be used as a diagnostic. Russian reflexive binding is subject to not-well-understood constraints, however, and judgments change significantly under scrambling (see Bailyn 2007 and references therein). Thus, we avoid it.

[18] Cases in which traces are realized as pronouns, epithets, or full copies exist. See, for example, the CLLD literature cited above, and also Boeckx (2003), Nunes (2004), and Aoun & Choueiri (2000). We ignore this possibility as Russian does not seem to allow this; scrambling in Russian obligatorily leaves a gap.

[19] An anonymous reviewer suggests that one might expect wrap-up effects at W9 because it is accompanied by a comma, which indicates a separate prosodic phrase. We do not see such an effect in the data; moreover, the role of commas in self-paced reading is less clear-cut than the role of full stops (cf. Hirotani et al. 2006). There is little research on the effect of commas on Russian processing; however, the results from Levy et al. (2008) suggest that the absence of appropriate punctuation marks may cause an extra slowdown in reading (see also Valgina 1979 and Rozental′ 1994 on the importance of proper punctuation in

Russian). It is therefore critical to maintain the standard punctuation for literate readers.

[20] Findings in Xiang et al. (2011) are relevant to this alternative hypothesis. They investigate the processing of morphological mismatches in Russian numerical expressions. One study looked at reading times when different numerals were followed by a nominal with appropriate or inappropriate morphology. For paucals, the following paradigm was investigated:

(i) V xore tri malen′kix mal′čik-a/*ø/*i/*ov
in choir three little.GEN.PL boy-PAUCAL/NOM.SG/NOM.PL/GEN.PL
v očkax stojali vperedi vsex.
in glasses stood.PL before all
'In the choir, three little boys in glasses stood before everyone.'

Despite acceptability ratings confirming that only the paucal form is acceptable in (i), reading times showed no statistically significant slow down at the head noun or the following word for any of the ungrammatical morphological forms compared to the grammatical paucal form. That is, there did not appear to be any processing effect due to morphological mismatch with paucal numerals. Their explanation for this effect was that the homophony of the paucal form with the genitive singular form resulted in a morphologically ambiguous phonological form that requires a longer processing time.

If this explanation is correct, then it is at odds with the findings here. As seen above, there is no slowdown at the paucal/genitive singular noun at W4. One can reconcile these two explanations if the slowdown seen in (i) is a result of difficulties integrating the morphologically ambiguous form with the preceding numeral and adjective. No such context was involved in the test sentences used here. For example, in (64), the morphologically ambiguous form is in isolation, not modified by any adjacent material with which it has to be integrated.